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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/837,882	04/18/2001	Christopher H. Pham	M-9570 US	8340

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EXAMINER	
TRAN, MAI T	

ART UNIT	PAPER NUMBER
2121	3

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/837,882	PHAM, CHRISTOPHER H.	
	Examiner	Art Unit	
	Mai T. Tran	2121	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 April 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *33-42* is/are allowed.

6)☒ Claim(s) *1-32* is/are rejected.

7)☒ Claim(s) *30* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED OFFICE ACTION

This Office Action is responsive to application 09837882, filed April 18, 2001.

Claims 1-42 have been examined

Claim Objections

Claim 30 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 11 are rejected under 35 U.S.C. 102 (b) as being anticipated by A. A. Al-Jumah and T. Arslan, "Artificial Neural Network Based Multiple Fault Diagnosis in Digital Circuits, IEEE (1998), hereinafter referred to as Al-Jumah.

Claim 1

A method of checking the integrity of one or more input vectors (page II-304, Abstract) to a digital hardware block (Fig. 2, Fig. 4), comprising the steps of:

identifying a set of known bad input vectors (col. 1, lines 28-30, page II-304) for the digital hardware block; and

training checking circuitry to selectively classify future input vectors to the digital hardware block as either good or not good, using the set of known bad input vectors (page II-304, col. 2, 8 lines from bottom until the end of column).

Claim 2

The method of Claim 1 further comprising the step of classifying a new input vector of the digital hardware block as not good, using the checking circuitry (page II-306, all of col. 1).

Claim 3

The method of Claim 1 wherein said training step trains the checking circuitry to classify as not good both future input vectors which are definitely faulty and future inputs vectors which are potentially faulty (page II-306, col. 2, lines 12-16). (Vector classification is determined by the threshold, which is determined by the user.)

AB 11/28/04

Claim 11

The method of Claim 1, further comprising the step of updating the checking circuitry online (page II-305, col. 1). We are interpreting "updating" as adding new data, and "online" to mean that the computer is on.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 4-9, 12, 20-27, 29, 31-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Al-Jumah as applied to claims 1-3, 11 above, and further in view of S. Y. Kung, "Digital Neural Networks", Chapter 2, pages 43-72, Prentice Hall, January 1988, hereinafter referred to as Kung.

Claims 10, 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Al-Jumah as applied to claims 1-3, 11 above, and further in view of Ton.

Claims 16-19, 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Al-Jumah as applied to claims 1-3, 11 above in view of Ton as applied to claims 10, 13-15, and further in view of Kung.

Claim 4

Al-Jumah discloses substantially all of applicant's claimed invention with the exception of training the network using a feedforward linear associative memory. Kung teaches the use of a feedforward linear associative memory to train a neural network. A person of ordinary skill in the art would be motivated to use such a network for the purpose of designing a network to retrieve patterns in one shot. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify Al-Jumah as taught by Kung for the purpose of designing a network to retrieve patterns in one shot.

Claim 5

Al-Jumah discloses substantially all of applicant's claimed invention with the exception of creating a weight matrix using a discrete Hopfield network algorithm. Kung teaches the use of a discrete Hopfield network algorithm to create a weight matrix.

Claim 6

Al-Jumah discloses substantially all of applicant's claimed invention with the exception of calculating the weight matrix W. Kung teaches the calculation of the weight matrix W according to the equation

$$w_{ij} = \sum_{m=1}^{M} (2a_i^{(m)} - 1)(2b_j^{(m)} - 1)$$

Where $a_1^{(m)}$ is the set of known bad vectors, $a_i=b_j$, M is the number of bad input vectors in the set of known bad input vectors, i is a row locator representing a particular bad vector, and j is a column locator representing a bit location.

Claim 7

Al-Jumah discloses substantially all of applicant's claimed invention with the exception of calculating an output vector $a^{(m)}$. Kung teaches the calculation of an output vector $a^{(m)}$ by multiplying the weight matrix W by the new input vector $b^{(m)}$, that is, $a^{(m)} = Wb^{(m)}$.

Claim 8

Al-Jumah discloses substantially all of applicant's claimed invention with the exception of adjusting elements of the output vector $a^{(m)}$. Kung teaches the adjusting elements of the output vector $a^{(m)}$ by its respective threshold θ, according to the equation

$$\theta i = - \tfrac{1}{2} \sum_{j=1}^{K} w_{ij}$$

Where K is the total number of bits in a vector.

Claim 9

Al-Jumah discloses substantially all of applicant's claimed invention with the exception of processing each of the adjusted elements. Kung teaches the process of each of the adjusted elements by a respective one of a plurality of non-linear units such that, when a given adjusted element is positive, an output

of the corresponding non-linear unit is 1 and, when a given adjusted element is not positive, the output of the corresponding non-linear unit is 0.

Claim 10, 13-15

Claims 10, 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Al-Jumah as applied to claims 1-3, 11 above, and further in view of Ton. Al-Jumah discloses substantially all of applicant's claimed invention with the exception of the software work-around. Ton teaches the use of software work-around that provides redundancy. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify Al-Jumah as taught by Ton for the purpose of providing redundancy to minimize the service interruption time.

Claim 12

Claims 12 ia rejected under 35 U.S.C. 103(a) as being unpatentable over Al-Jumah as applied to claims 1-3, 11 above, and further in view of S. Y. Kung. Al-Jumah discloses substantially all of applicant's claimed invention with the exception training the network using a feedforward linear associative memory. Kung teaches the use of a feedforward linear associative memory neural network having a weight matrix W and reconfiguring the weight matrix W using one or more additional bad input vectors.

Claim 16-19

Claims 16-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Al-Jumah in view of Ton as set forth above with regards to claims 13-15, and further in view of Kung. Al-Jumah does not teach the use of a linear

associative memory. Kung teaches the use of a feedforward linear associative memory to train a neural network. A person of ordinary skill in the art would be motivated to use such a network for the purpose of designing a network to retrieve patterns in one shot. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify Al-Jumah as taught by Kung for the purpose of designing a network to retrieve patterns in one shot.

Claim 28

Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Al-Jumah as applied to claims 1-3, 11 above in view of Ton as applied to claims 10, 13-15, and further in view of Kung. Al-Jumah discloses substantially all of applicant's claimed invention with the exception of having a weight matrix. Kung teaches the use of a discrete Hopfield network algorithm to create a weight matrix. Ton teaches the use of software work-around that provides redundancy. We are interpreting blocking as isolating the faulty components.

Claim 20

Claims 20-27, 29, 31-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Al-Jumah as applied to claims 1-3, 11 above, and further in view of S. Y. Kung. Al-Jumah discloses substantially all of applicant's claimed invention with the exception of having a weight matrix. Kung teaches the use of a discrete Hopfield network algorithm to create a weight matrix.

Claim 21-22

Al-Jumah discloses substantially all of applicant's claimed invention with the exception of training the network using a feedforward linear associative memory. Kung teaches the use of a feedforward linear associative memory to train a neural network.

Claim 23

Al-Jumah discloses substantially all of applicant's claimed invention with the exception of calculating the weight matrix W. Kung teaches the calculation of the weight matrix W according to the equation

$$w_{ij} = \sum_{m=1}^{M} (2a_i^{(m)} - 1)(2b_j^{(m)} - 1)$$

where $a^{(m)}$ is the set of known bad vectors, $a_i=b_j$, M is the number of bad input vectors in the set of known bad input vectors, i is a row locator representing a particular bad vector, and j is a column locator representing a bit location.

Claim 24

Al-Jumah discloses substantially all of applicant's claimed invention with the exception of calculating an output vector $a^{(m)}$. Kung teaches the calculation of an output vector $a^{(m)}$ by multiplying the weight matrix W by the new input vector $b^{(m)}$, that is, $a^{(m)} = Wb^{(m)}$.

Claim 25

Al-Jumah discloses substantially all of applicant's claimed invention with the exception of adjusting elements of the output vector $a^{(m)}$. Kung teaches the

adjusting elements of the output vector $a^{(m)}$ by its respective threshold θ, according to the equation

$$\theta i = - \tfrac{1}{2} \sum_{j=1}^{K} w_{ij}$$

Where K is the total number of bits in a vector.

Claim 26

Al-Jumah discloses substantially all of applicant's claimed invention with the exception of processing each of the adjusted elements. Kung teaches the process of each of the adjusted elements by a respective one of a plurality of non-linear units such that, when a given adjusted element is positive, an output of the corresponding non-linear unit is 1 and, when a given adjusted element is not positive, the output of the corresponding non-linear unit is 0.

Claim 27

The circuit of Claim 20 wherein said classifying means classifies a given input vector as good or not good in less than 60 ns.

AG 11/29/04

With respect to claim 27, the specific time period given is considered to be within the level of ordinary skill in the art, and in the absence of any showing of an unexpected result is not considered to make the claim patentable.

Claim 29

Al-Jumah discloses substantially all of applicant's claimed invention with the exception of having a weight matrix. Kung teaches the use of a discrete

Hopfield network algorithm to create a weight matrix. We are interpreting "updating" as adding new data, and "online" to mean that the computer is on.

Claim 31

Al-Jumah discloses substantially all of applicant's claimed invention with the exception of having a weight matrix. Kung teaches the use of a discrete Hopfield network algorithm to create a weight matrix. Vector classification is determined by the threshold, which is determined by the user.

Claim 32

Official Notice is taken that an associative memory is a content-addressable memory.

Allowable Subject Matter

Claims 33-42 are allowed.

The following is an examiner's statement of reasons for allowance: It is the combination of elements set forth in claim 33, and in particular, the selection circuit connected to the checking circuit.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

1. Tomlinson, U.S. Patent Number 4,918,618, discloses a Discrete Weight Neural Network.

2. Mehta, U.S. Patent Number 3,777,129 discloses a method for fault detection and localization in Digital Systems.

3. Cooper, U.S. Patent Number 6,009,418 discloses a method and apparatus for neural networking using semantic attractor architecture.

4. Watanabe et al., U.S. Patent Number 5,875,347 discloses a neural network processing system using semiconductor memories.

5. Moussa et al, U.S. Patent Number 5,680,470 discloses a method of automated signature verification

6. Kothari et al, U.S. Patent Number 5,467,427 discloses a memory capacity neural network

7. Specifications and FPGA Implementation of a systol Hopfield-type associative memory by I. Z. Mihu, R. Brad, and M. Breazu, Neural Networks, 2001. Proceedings 01, pages 228-233, Vol. 1

8. Fault Diagnosis of Analog Circuits with Tolerances Using Artificial Neural Networks by Ying Deng, yigang He, and Yichuang Sun IEEE 2000

9. Fault Tolerance of Feedforward Artificial Neural Networks - A Framework of Study by Pravin Chandra, IEEE 2003

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mai T. Tran whose telephone number is (571) 272-4238. The examiner can normally be reached on M-F 8:30am -- 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anthony Knight can be reached on (571) 272-3687. The

fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mai T. Tran
Patent Examiner
Date: 11/29/04

Anthony Knight
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